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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/501,146	07/13/2004	Ronny Losfeld	016782-0309	6103
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EXAMINER				
HAN, KWANG S				
ART UNIT		PAPER NUMBER		
4132				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/501,146

**Applicant(s)**

LOSFELD ET AL.

**Examiner**

Kwang Han

**Art Unit**

4132

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 7/13/2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 7/13/2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/ISD)
- Paper No(s)/Mail Date 7/13/2004

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

***Drawings***

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the fuel cell element 60 (described in the specification page 16) in Figure 6, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner,

the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

3. The abstract of the disclosure does not commence on a separate sheet in accordance with 37 CFR 1.52(b)(4). A new abstract of the disclosure is required and must be presented on a separate sheet, apart from any other text.
4. The disclosure is objected to because of the following informalities: the word "therefor" is spelled incorrectly (Page 2, Line 16), the term "to1" is not one word, the term "arebundle" is not one word.

Appropriate correction is required.

***Claim Objections***

5. Claims 1-19, 21, and 22 are objected to because of the following informalities: Regarding claims 1-19, 21, and 22 the word "electrolyser" is misspelled. It should be spelled "electrolyzer".

Appropriate correction is required.

***Claim Rejections - 35 USC § 101 and 112***

6. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 22 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 22 provides for the use of "a stack", but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.

Claim 22 is rejected under 35 U.S.C. 101 because the claimed recitation of a use, without setting forth any steps involved in the process, results in an improper definition of a process, i.e., results in a claim which is not a proper process claim under 35 U.S.C. 101. See for example *Ex parte Dunki*, 153 USPQ 678 (Bd.App. 1967) and *Clinical Products, Ltd. v. Brenner*, 255 F. Supp. 131, 149 USPQ 475 (D.D.C. 1966).

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

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2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 1, 2, 4, 8, and 13-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. (US 6232010) in view of Rammuni et al. (US 6022634).

Regarding claim 1, Cisar et al. is directed to a fuel cell or electrolyzer (electrochemical reactor) comprising of:

- a collector layer (Figure 15 Element 112, foil separator), diffusion layer (Figure 15 Element 104, distribution layer), and an anchoring layer (Figure 15 Element 102, porous flow field),
- collector layer being a metal foil or plate (Column 9 Line 36),
- diffusion layer being a metal mesh, expanded metal sheet or sheet of foamed metal (Column 9 Lines 6-7; Claim 8),
- anchoring layer comprised of metal fibers (Column 5 Lines 2-6; Claim 10),
- anchoring layer provided between collector layer and diffusion layer (Figure 15), and
- collector layer, anchoring layer, and diffusion layer being sintered to each other (Column 9 Lines 45-49).

Cisar et al. is silent as to having an anchoring layer thickness of less than 0.5mm.

Rammuni et al. teaches the use of metal gauze within a fuel cell stack that has a thickness of 0.1-0.3mm (Column 3 Line 46-58). It would have been obvious to one of ordinary skill in the art at the time of the invention to use Rammuni's fuel cell layer thickness in Cisar's anchoring layer because Rammuni teaches that the layer should be

sufficient to allow for contact pressure and to form channels to feed the gas and discharge condensates. Further, Cisar discloses that it's generally known in the art to decrease the thickness of fuel cell plates (Column 2 Lines 59-61) because it is commonly known in the art that minimizing the plate thickness reduces the distance required for reactants to travel to the reactant sites. Also, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an anchoring layer thickness of 0.5mm or less since it has been held that discovering the optimum ranges for a result effective variable such as the thickness of the anchoring layer involves only routine skill in the art in the absence of showing of criticality in the claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

Regarding claim 2, Cisar discloses a fuel cell or electrolyzer comprising of two diffusion layers and two anchoring layers disposed between the diffusion layer and collector layer, with the anchoring and diffusion layers being on opposing sides of the collector layer (Figure 15).

Regarding claim 4, Cisar discloses an anchoring layer having a porosity of 95% (Column 7 Line 50). This was determined using applicants disclosed definition of porosity on page 8 of specification.

Regarding claim 8, Cisar modified by Rammuni is silent as to having a diffusion layer comprised of an expanded metal sheet having a thickness of less than 1.2mm. Cisar does disclose an expanded metal sheet for a porous metal flow field (Column 5 Lines 2-4) and also that thinner diffusion materials can be made if needed, thus recognizing that the thickness of the metal sheet is a result effective variable (Column 9

Lines 15-20). Thinner diffusion materials allow for shorter distance to the gas reactant sites. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a diffusion layer thickness of less than 1.2mm since it has been held that discovering the optimum ranges for a result effective variable such as the thickness of the diffusion layer involves only routine skill in the art in the absence of showing of criticality in the claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

Regarding claims 13 and 14, Cisar does not disclose a fuel cell or electrolyzer with an air permeability flow rate (Column 8 Lines 21-35) as claimed by the applicant, but does recognize that air permeability is a result effective variable. It would have been obvious to one of ordinary skill in the art at the time of the invention vary the air permeability flow rate since it has been held that discovering the optimum ranges for a result effective variable such as the air permeability flow rate involves only routine skill in the art in the absence of showing of criticality in the claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

Regarding claim 15, 16, and 17 Cisar discloses a fuel cell or electrolyzer with an anchoring layer being comprised of stainless steel, nickel or nickel alloy, and titanium (Claim 11).

Regarding claim 18 and 19, Cisar discloses all of the layers of the fuel cell or electrolyzer being provided of the same metal or alloy (Claim 31, 36).

Regarding claims 20-22, Cisar discloses a fuel cell or electrolyzer (electrochemical reactor) comprising of stacks (Abstract).

10. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. in view of Rammuni et al. as applied to claim 1 above. Supporting evidence provided by Winter ([www.webelements.com](http://www.webelements.com), nickel).

Regarding claim 3, Cisar discloses an anchoring layer having a weight of less than  $350 \text{ g/m}^2$  as evidence by the use of a nickel foam material for the anchoring layer (Column 7 Lines 45-60). Using applicants disclosed thickness of 0.5mm at nominal density of 5% as disclosed in Cisar (Column 7 Line 50) and using the density of solid nickel at  $8908 \text{ kg/m}^3$  (Winter, nickel properties), the calculated density for the metal foam would be  $22.25 \text{ g/m}^2$ .

11. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. in view of Rammuni et al. as applied to claim 1 above, and further in view of Yamashita et al. (US 5441822).

Regarding claim 5, Cisar modified by Rammuni do not disclose a diffusion layer having an open area of more than 30%, but Cisar does disclose the formation of a porous metal component of a controlled porosity by controlling the size distribution of the spheres and the sintering conditions (Column 8 Line 36-42) recognizing that porosity is a result effective variable. Further, Yamashita discloses a diffusion layer within a fuel cell having a porosity of about 70% (Column 6 Lines 47-48). It would have been obvious to one of ordinary skill in the art at the time of the invention to use Yamashita's diffusion layer in Cisar's fuel cell or electrolyzer because it was known in the art to use a diffusion layer with some degree of open area or porosity to allow for permeability and it has been held that discovering the optimum ranges for a result

effective variable such as the amount of open area in a diffusion layer involves only routine skill in the art in the absence of showing of criticality in the claimed range. See *In re, Boesch* 617 F.2d 272, 205 USPQ 215 (CCPA 1980) and (See MPEP 2144.05).

Regarding claim 6, Cisar and Rammuni do not disclose a diffusion layer thickness. Yamashita teaches the use of a diffusion layer having a thickness of about 1.6mm for a fuel cell (Column 5 Line 32). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use Yamashita's diffusion layer in Cisar's fuel cell or electrolyzer for the benefit of sufficiently distributing the gasses for the electrochemical reaction.

12. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. in view of Rammuni et al. as applied to claim 1 above, and further in view of Faita et al. (US 5482792).

Regarding claim 7, Cisar and Rammuni do not disclose a diffusion layer comprised of a metal mesh having a wire diameter of more than 0.5mm. Cisar discloses the use of micro and macro particles to form sintered porous metals to form the electrode substrates (Column 8, Lines 44-46). Faita teaches a current collector of a fuel cell that is composed of wires with the diameter between 0.01 and 1 mm (Column 9 Lines 2-3). It would have been obvious to one of ordinary skill in the art to use Faita's layer composed of wires in Cisar's fuel cell or electrolyzer for the benefit of distributing the gases for the electrochemical reaction.

13. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. and Rammuni et al. as applied to claims 1 and 10 above, and further in view of Simpkins et al. (US 6613468).

Regarding claim 10, Cisar does not expressly disclose a contact layer being sintered to the opposing side of the diffusion layer connected to the anchoring layer. Applicant is directed to claim 1 for the discussion on sintering of the components and anchoring layer. Simpkins teaches the use of gas diffusion mats composed of fibrous material that are disposed on opposite sides of a spacer for a fuel cell (Column 4 Line 40–Column 5 Line 28). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use Simpkin's gas diffusion mats in Cisar's fuel cell or electrolyzer as a contact layer because Simpkin's teaches that these mats are used to provide mechanical pressure and to maintain electrical connectivity (Column 5 Lines 1-5)

Regarding claim 12, Cisar and Rammuni are silent as to the thickness of the contact layer. Cisar discloses that sintered metal felts can be made to the required thickness if needed (Column 9 Lines 16-19). Simpkins et al. teaches the use of a gas diffusion mat which can be comprised of one or multiple layers with a low end thickness of 100 microns (Column 5 Lines 21-23). Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to apply Simpkin's mat as a contact layer in Cisar's fuel cell or electrolyzer because both are used in the cell arts and Simpkin's mat would structurally meet the requirements.

14. Claims 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cisar et al. and Rammuni et al. as applied to claims 1 and 10 above, and further in view of Reichner (US 4791035).

Regarding claims 9 and 11, Cisar modified by Rammuni are silent towards the thickness of the metal fibers of the anchoring layer. Reichner teaches a fibrous metal strip in an electrolyte electrochemical cell with the fibers ranging in diameter from 0.0013cm to 0.025cm (Column 6 Lines 29-32). Therefore it would have been obvious to use Reichner's metal fibers in Cisar's fuel cell or electrolyzer because it is desirable to minimize the diameter of the fibers to increase porosity.

***Contact/Correspondence Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Ward can be reached on (571) 272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./

Examiner, Art Unit 4132

/Jessica Ward/

Supervisory Patent Examiner, Art Unit 4132